

WHAT IS CLAIMED IS:

1. A stator assembly comprising:
 - a plurality of stator coil assemblies; and
 - a stator coil support structure constructed of a non-magnetic, thermally-conductive material, said stator coil support structure including:
 - an axial passage for receiving a rotor assembly; and
 - a plurality of channels positioned radially about said axial passage, each said channel being configured to receive one or more of said stator coil assemblies.
2. The stator assembly of claim 1 wherein each said stator coil assembly is surrounded by a ground plane assembly.
3. The stator assembly of claim 1 further comprising a magnetic annular assembly surrounding said stator coil support structure, wherein said magnetic annular assembly includes a plurality of axial coolant passages.
4. The stator assembly of claim 3 further comprising a coolant circulation system for circulating a cooling liquid through said axial coolant passages.
5. The stator assembly of claim 1 wherein said non-magnetic, thermally conductive material is a sheet material, said sheet material being laminated to form said stator coil support structure.
6. The stator assembly of claim 5 wherein said sheet material is a polymer-based adhesive.
7. The stator assembly of claim 5 wherein said sheet material a graphite-based material.
8. The stator assembly of claim 1 further comprising an epoxy filler disposed between said stator coil assemblies and said stator coil support structure.

1 9. A superconducting rotating machine comprising:

2 a stator assembly including a plurality of stator coil assemblies, and a stator
3 coil support structure constructed of a non-magnetic, thermally-conductive material,
4 said stator coil support structure including:

5 an axial passage for receiving a rotor assembly; and

6 a plurality of channels positioned radially about said axial passage,
7 each said channel being configured to receive one or more of said stator coil
8 assemblies; and

9 a rotor assembly configured to rotate within said stator assembly, said rotor
10 assembly including an axial shaft, and at least one superconducting rotor winding
11 assembly.

1 10. The superconducting rotating machine of claim 9 wherein each said stator coil
2 assembly is surrounded by a ground plane assembly.

1 11. The superconducting rotating machine of claim 9 wherein said stator assembly further
2 includes a magnetic annular assembly surrounding said stator coil support structure, wherein
3 said magnetic annular assembly includes a plurality of axial coolant passages.

1 12. The superconducting rotating machine of claim 11 further comprising a coolant
2 circulation system for circulating a cooling liquid through said axial coolant passages.

1 13. The superconducting rotating machine of claim 9 wherein said non-magnetic,
2 thermally conductive material is a sheet material, said sheet material being laminated to form
3 said stator coil support structure.

1 14. The superconducting rotating machine of claim 13 wherein said sheet material is a
2 polymer-based adhesive.

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1 15. The superconducting rotating machine of claim 13 wherein said sheet material is a
2 graphite-based material.

1 16. The superconducting rotating machine of claim 9 further comprising an epoxy filler
2 disposed between said stator coil assemblies and said stator coil support structure.

1 17. The superconducting rotating machine of claim 9 wherein said at least one
2 superconducting rotor winding assembly is constructed using a high-temperature,
3 superconducting material.

1 18. The superconducting rotating machine of claim 17 wherein said high temperature,
2 superconducting material is chosen from the group consisting of: thallium-barium-calcium-
3 copper-oxide; bismuth-strontium-calcium-copper-oxide; mercury-barium-calcium-copper-
4 oxide; and yttrium-barium-copper-oxide.

1 19. The superconducting rotating machine of claim 9 further comprising a refrigeration
2 system for cooling said at least one superconducting rotor winding assembly.

1 20. A method of manufacturing a stator coil support structure comprising:
2 forming a non-magnetic, thermally conductive cylindrical structure;
3 forming a plurality of axial channels radially about the non-magnetic,
4 thermally conductive cylindrical structure; and
5 positioning one or more stator coil assemblies in each of the channels.

1 21. The method of claim 20 wherein said forming a non-magnetic, thermally conductive
2 cylindrical structure includes laminating multiple layers of a non-magnetic, thermally
3 conductive sheet material to form the non-magnetic, thermally conductive cylindrical
4 structure.

1 22. The method of claim 20 wherein said forming a non-magnetic, thermally conductive
2 cylindrical structure includes casting a non-magnetic, thermally conductive material to form
3 the non-magnetic, thermally conductive cylindrical structure.

1 23. The method of claim 20 further comprising:
2 providing a plurality of axial coolant passages in the non-magnetic, thermally
3 conductive cylindrical structure.

1 24. The method of claim 20 further comprising:
2 depositing an epoxy filler between the stator coil assemblies and the non-
3 magnetic, thermally conductive cylindrical structure.

1 25. A method of manufacturing a stator coil support structure comprising:
2 forming a non-magnetic, thermally conductive cylindrical structure;
3 forming a plurality of axial slots radially about the non-magnetic, thermally
4 conductive cylindrical structure;
5 inserting into each axial slot a heat-sinking member, thus forming a channel
6 between each pair of adjacent heating-sinking members; and
7 positioning one or more of the stator coil assemblies in each of the channels.

1 26. The method of claim 25 wherein said forming a non-magnetic, thermally conductive
2 cylindrical structure includes laminating multiple layers of a non-magnetic, thermally
3 conductive sheet material to form the non-magnetic, thermally conductive cylindrical
4 structure.

1 27. The method of claim 25 wherein said forming a non-magnetic, thermally conductive
2 cylindrical structure includes casting a non-magnetic, thermally conductive material to form
3 the non-magnetic, thermally conductive cylindrical structure.

1 28. The method of claim 25 further comprising:
2 providing a plurality of axial coolant passages in the non-magnetic, thermally
3 conductive cylindrical structure.

1 29. The method of claim 25 further comprising:
2 depositing an epoxy filler between the stator coil assemblies and the non-
3 magnetic, thermally conductive cylindrical structure.

1 30. A stator assembly comprising:

2 a plurality of stator coil assemblies;

3 a magnetic annular assembly; and

4 a plurality of non-magnetic, thermally-conductive heat sinking
5 members positioned radially about said magnetic annular assembly, thus
6 forming a plurality of channels, each being configured to receive one or more
7 of said stator coil assemblies.

1 31. The stator assembly of claim 30 wherein said magnetic annular assembly includes a
2 plurality of axial coolant passages.

1 32. The stator assembly of claim 31 further comprising a coolant circulation system for
2 circulating a cooling liquid through said axial coolant passages.

1 33. The stator assembly of claim 30 wherein said non-magnetic, thermally-conductive
2 heat sinking members are constructed of a non-magnetic, thermally conductive sheet
3 material, wherein said sheet material is laminated to form said non-magnetic, thermally-
4 conductive heat sinking members.

1 34. The stator assembly of claim 33 wherein said sheet material is a polymer-based
2 adhesive.

1 35. The stator assembly of claim 33 wherein said sheet material a graphite-based
2 material.

1 36. The stator assembly of claim 30 further comprising an epoxy filler disposed between
2 said stator coil assemblies and said non-magnetic, thermally-conductive heat sinking
3 members.

1 37. A method of manufacturing a stator coil support structure comprising:
2 forming a magnetic annular assembly;
3 forming a plurality of non-magnetic, thermally-conductive heat sinking
4 members;
5 positioning the heat-sinking members radially about the magnetic annular
6 assembly, thus forming a channel between each pair of adjacent heating-sinking
7 members; and
8 positioning one or more of the stator coil assemblies in each of the channels.

1 38. The method of claim 37 wherein said forming a plurality of non-magnetic, thermally
2 conductive heat-sinking members includes laminating multiple layers of a non-magnetic,
3 thermally conductive sheet material to form the non-magnetic, thermally conductive heat-
4 sinking members.

1 39. The method of claim 37 wherein said forming a plurality of non-magnetic, thermally
2 conductive heat-sinking members includes casting a non-magnetic, thermally conductive
3 material to form the non-magnetic, thermally conductive heat-sinking members.

1 40. The method of claim 37 further comprising providing a plurality of axial coolant
2 passages in the magnetic annular assembly.

1 41. The method of claim 37 further comprising depositing an epoxy filler between the
2 stator coil assemblies and the non-magnetic, thermally conductive heat-sinking members.